VOL. 2 No. 5 May 1985

COMPUTER DIGEST

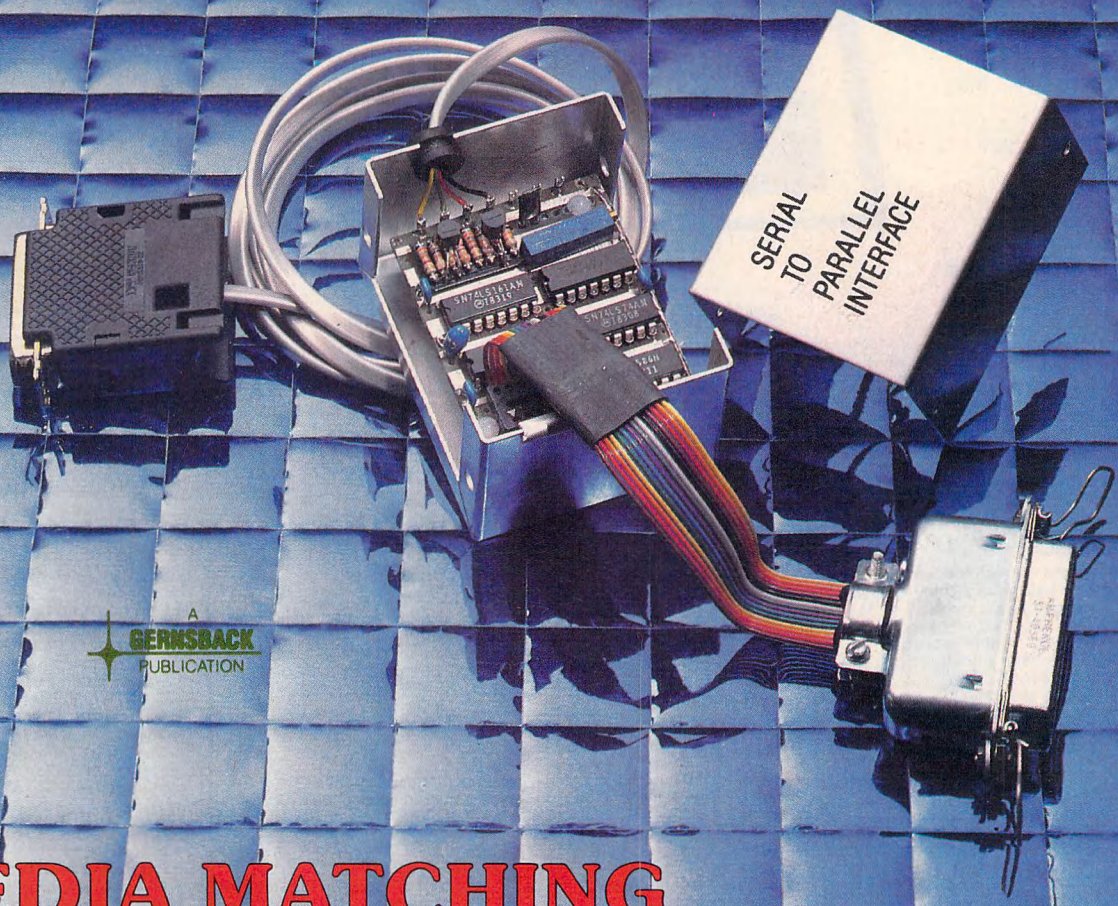
NEW KIND OF MAGAZINE FOR ELECTRONICS PROFESSIONALS

SERIAL-TO-PARALLEL INTERFACE

A Build-It-Yourself Problem Solver

MODEM MINDER

No more sitting and waiting. This device calls you!



A GERNSBACK PUBLICATION

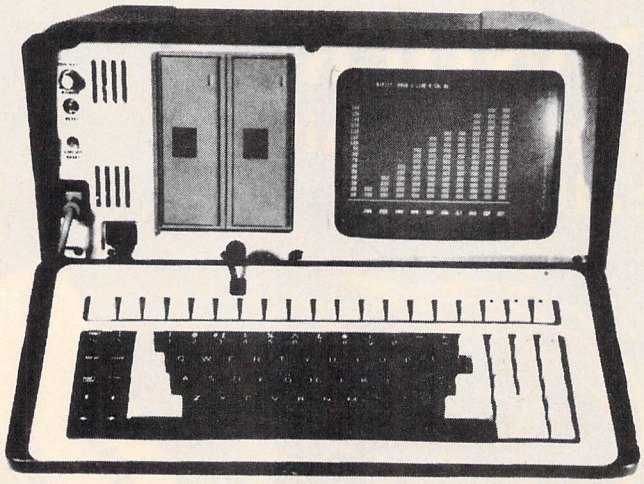
MEDIA MATCHING

Disk translator software can make alien computer discs compatible.

ZORBA
PORTABLE COMPUTER
THE EXPERTS' CHOICE

FEATURES:

- 9" GREEN OR AMBER CRT
- 19 INDEPENDENT 55 PROGRAMMABLE FUNCTION KEYS
- TWO 400K DSDD DRIVES
- 64K BYTES 200 NS RAM
- C BASIC COMPILER
- IEEE 488 BUS MASTER PORT
- 24.6 LBS
- CPM 2.2 OPERATING SYSTEM
- M80 (L80, LIB80, CREF80)
- SOURCE CODE OF THE BIOS PLUS UTILITIES
- DATA COMMUNICATIONS SETUP PACKAGE
- SERIAL & PARALLEL PRINTER PORT
- DATA COMMUNICATION PORT



OPTIONS:

- 16 BIT 256K RAM UPGRADE (8088 CPU) $600.00
- 800K DSQD 96TPI DRIVES $200.00
- COMPOSITE VIDEO OUTPUT $100.00
- SOFT VINYL CASE $25.00
- TUTOR KIT; $15.00 (CPM, WORDSTAR, CALCSTAR)
- SCHEMATIC SET $10.00
- 10MB HARD DISK DRIVE

VISA/MC

BUNDLED WITH
WORDSTAR, MAIL MERG, SPELLSTAR,
DATA STAR, REPORTSTAR, CALCSTAR

$899.00
W/O Bundle

DEALER INQUIRIES INVITED

$1049.00
With Bundle

General Specifications

ZORBA is the lowest cost full featured portable computer. This light weight computer is ruggedly packaged in a convenient carrying case. The case surrounds a strong inner chassis which further protects the Z80A based computer with its two double sided double density disk 400K drives, large easy to read 9" display screen and well designed detachable keyboard.

ZORBA uses CP/M, the industry standard operating system, which means that a wide range of existing software is readily available to the user.

The ZORBA users manual covers operation of the unit, all supplied software and all interface and internal information. A system diskette is supplied with all system files and utilities. A second diskette contains the sources for all ZORBA software including BIOS, SETUP, FORMAT, and PATCH.

Keyboard

Keyboard communicates serially with CPU
Detachable with 2 foot coiled cord
95 keys in standard QWERTY format
13 Key Numeric pad
Independent Caps Lock and Shift Lock
55 Software programmable function keys
All keys auto-repeat after 1 second delay
All Standard cursor and terminal control keys

Disk System

Controller:	WD1793
Drives:	5.25 Double Sided, Double Density, 400K 48 TPI

Built-in disk interchange formats: Xerox 820 (SD, DD), Kaycomp (DD), DEC VT-180 (SD), Osborne (SD) and IBM-PC (eg. CPM/86) and Televideo 802 (Read/Write and Format compatibility) (Expandable to 61 Formats)

Specifications
General Mechanical and Electrical

Width	-17.5 inches (44.45 cm)
Height	- 9.0 inches (22.86 cm)
Depth	-16.0 inches (40.64 cm)
Weight	-24.6 pounds (11.1 Kg)
Power	-80-130 VAC or 190-245 VAC 50/60 Hz 170 watts max

Display

Display Tube:
9" diagonal, Green or Amber
High resolution display circuitry
60 Hz refresh rate

Display Format:
25 lines x 80 columns
5x7 Character Font with full descenders
128 ASCII Characters
8x9 32 Characters Graphic Font
2K Memory Mapped Display Buffer

CPU Board

Z80A CPU running at 4 Mhz with no wait states
64K bytes of 200 ns RAM (58K after CP/M loaded)
16K bytes of EPROM (2732) can be switched in and out by software 12K available for user EPROMS
8275 CRT controller, DMA driven
1793 Floppy disk controller, SMC data separator
Bipolar proms configure 10 addresses
Fully structured interrupts prioritized by bipolar proms

Interfaces

- Full asynchronous RS232 port with modem control. Baud rates and data translation and protocol programmable
- Full asynchronous full duplex RS232 port with hardware handshake (for printers). Baud rates and protocol programmable. (Serial Printer Port)
- One 8 Bit parallel port with independent strobe and ready lines. Supports Centronics interface with an available adaptor cable.
- IEEE 488 Bus Master Port (ie: General Purpose Instrumentation Bus) not Software Supported.
- 21 Standard Software Programmable Baud Rates: 45.5 to 19,200 BPS

GEMINI ELECTRONICS, INC.
130 Baywood Avenue, Longwood, Florida 32750
305-830-8886 800-327-7182

CIRCLE 265 ON FREE INFORMATION CARD

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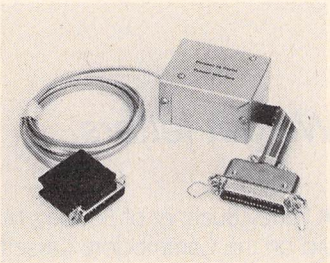

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8 Parallel-to-Serial Printer Interface
This quick-and-easy project will allow you to interface a Centronics parallel output to an RS232 Serial printer. **R.L.L. Hu**

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You don't have to sit there waiting and watching. This device does it for you, and calls you when you've made contact! **Kirk Vistain**

14 Media Matching
You can mix 'em and match 'em—Computers and media, that is—If you know what you're doing, incompatibility can be overcome. **Herb Friedman**

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5 Computer Products

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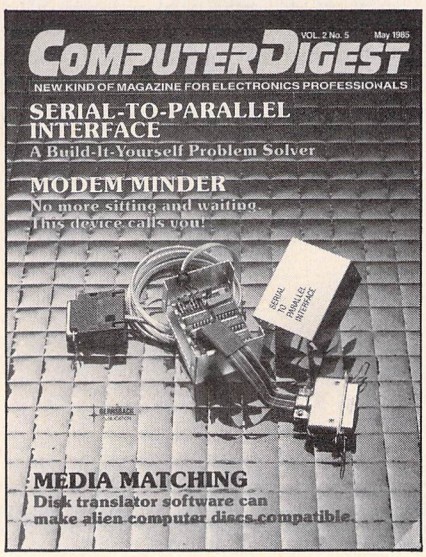
Radio Electronics YOUR OWN Computer

ON THE COVER

More and more, people are collecting equipment that may be very useful, but not compatible. If you have a Centronics output on the computer you want to connect to a printer with an RS232 connector, this interface device will make it all possible. See page 8.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EDITORIAL

We get letters...

■Charley Buehner of Scobey, MT, wrote to say that he liked the piece we did on the Commodore Cassette Interface, but that he has an Atari. His friend has a Commodore *Plus/4* which has a din port connector, and Charley wants to know if there's anything that they can do.

Charley, it's a problem.

There are so many varieties of computer out there, and we have only 16 (count'em) pages each month! The name of the game, of course, is "standardization" which would put us all back in the game. It all really began when the resistor manufacturers decided on a standardized color-coding system that really worked out well for everybody. The capacitor manufacturers *tried* to follow suit, but the result was utter chaos, with ramifications, ifs, and's and but's.

In the world of computers, standardization was attempted with interconnects, the RS-232 being the biggest bug-a-boo of all. Still, it's *called* a "standard," and we have to live with it. So non-standard is this standard, that hundreds of articles have been (and still are) written about it. At least one manufacturer offers a cable that lets you interconnect regardless of deviations from that so-called standard!

We attempt to aim articles at the various types of computers, but no magazine can be all things to all men. What's needed, we feel, is an organization of computer manufacturers that will sit down like rational people and try to sort things out with an eye toward simplification.

It seems that they're all willing to adopt standards, provided that the methods and systems they now use themselves, are adopted as the "standard." And chances are that even if that *were* to happen, they'd claim a proprietary interest and stop it all with a law suit!

There doesn't seem to be a simple solution, if solution there is at all. We can only hope for that Utopian day when there will be peace on Earth, no more crime, no more famine, love will once again prevail, and all computers, regardless of manufacture, can use any software or peripherals without complicated and devious rework.

But if you think the Peace Talks get bogged down, just try getting computer manufacturers to talk to each other. Kissinger could have a field day with those people! But until the time that happens, we're all going to have to suffer with non-standard standards.

Byron G. Wels

Byron G. Wels
Editor

ComputerDigest is published monthly as an insert in Radio-Electronics magazine by Gernsback Publications, Inc., 200 Park Avenue South, New York, NY 10003. Second-Class Postage Paid at New York, N.Y. and additional mailing offices. All rights reserved. Printed in U.S.A.

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LETTERS

Glitch!

There seems to have been a slight glitch in the program listed in the March, 1985 issue in the story on Morse Code Practice On Your Commodore. Have you heard from others? Have you located the problem?—P. Childers, Orlando, FL.

Yes. Here are the corrections: Line 30 should have a comma, not a decimal point; Line 290 should read: EL (1)=R:For I=2 to N. Line 300 should read P=N-I and line 480 should read GOTO 210. Other than that, Bob Woods, our author, assures us that everything else is O.K.

Bottom line

I went to a "computer store" recently, more to window shop than to buy, but I did get to talk to a salesman. Actually, he did the talking, I listened. He was obviously trying to fast-talk me into buying a product I neither needed nor wanted, but which carried a heavy price tag, and I assume, a heavy commission for him. He steered me around the aisles to the equipment *he* wanted me to see, I couldn't get a word in edgewise, and he got more and more insistent as I got angrier and angrier. How do you handle a situation like that?—B. Pettigrew, Seattle, WA.

The way I handle that kind of situation is simply to walk out and let him stand there and talk. Then go back to the same shop a month later. Chances are he won't be there any more.

Seiko Misses The Mark

After reading your article by Marc Stern in the February Issue, (Seiko's Datagraph System) I feel I must comment. The article, though an excellent promotion for Seiko, did not point out any of the system's obvious failings. Perhaps the author did not have the opportunity to use one. I did, and found sufficient reason to return the product to the place of purchase.

The first failing was a distinct lack of contrast in the display. The viewing angle was more critical than an ordinary LCD watch. As there is no provision for use at night (no back lighting or light) the watch functions (much less the data functions) are unusable at night or in dim light. The actual computing and recording utility, from a practical standpoint, is diminished by having to carry the keyboard module (which does not appear to be too sturdily built). The alarm function could have been enhanced by having multiple alarms tagged to different messages, but as it currently stands, it is limited to one.

In a nutshell, Seiko's wrist "computer," despite its excellent technology, fails to provide sufficient utility as either a watch or a computer to merit its price tag. It is a good step in the right direction, but falls short of the mark.—C. N. Austin, TX

C. N., I can assure you that Marc did indeed test the system, and liked it. I guess differences of opinion are the reason that we hold elections!

Worried

I like the idea of computers being made smaller and more portable, but this also makes them more susceptible to theft. They're easily negotiable, and make fine targets for burglars. What's the best way to protect a computer against robbery?—C. Simpson, Ft. Lauderdale, FL.

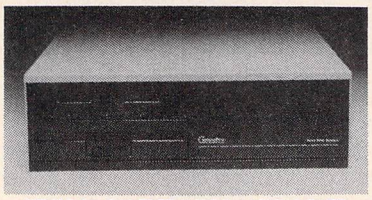
You'll find a wide variety of devices to protect a computer from theft. But don't forget, when you buy a computer, to notify your homeowner's insurance agent so you can get it covered under your regular policy.

COMPUTER PRODUCTS

For more details use the free information card inside the back cover

SUBSYSTEM OPTION, has been designed by the Viasyn Corporation (formerly known as CompuPro) as a mass storage option for its *System 816* microcomputers that allows the user to tailor a disk system to fit his or her particular application needs.

The new *Tri-Disk Subsystem* offers combinations of either one 8-inch and one 5.25-inch floppy disk drive, or two 8-inch floppy drives, and a 5.25-inch hard disk available in choices of 20 or 40 Mbytes.



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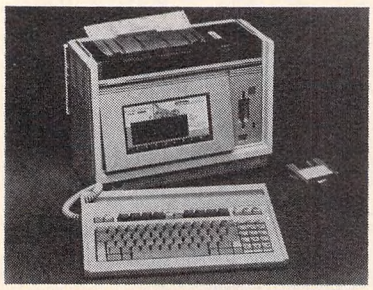
The *Tri-Disk System* featuring either the 8- and 5.25-inch floppies, or the dual 8-inch floppies, is priced at $4,995, with the 20 Mbyte hard disk. With the 40 Mbyte hard disk, the price is $5,495.—**Viasyn Corporation,** 450 Newport Center Drive, Suite 200, Newport Beach, CA 92660.

COMPUTER SYSTEM, the *Integral Personal Computer,* comes in a 25-pound

transportable package with a built-in ThinkJet printer, a 3½-inch double-sided disk drive, a 9-inch electroluminescent display, and a full-size keyboard. It is based on the Motorola 68000 16/32-bit processor and a 16-bit HP graphics processor. Standard memory is 800 Kbytes, which can be expanded by the two standard input/output (I/O) slots. Also standard is the HP-IB expansion interface (IBEEE 488); and there are five interface options that can be plugged into the I/O slots.



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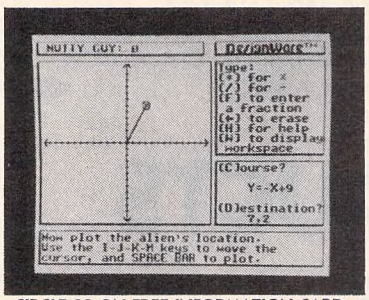
The Integral Personal Computer is priced at $4,995.00—**Hewlett Packard Company,** 1020 N.E. Circle Boulevard, Corvallis, OR 97330.

EDUCATIONAL GAME, *Mission: Algebra,* provides kids age 13 to 18 with an entertaining, educationally sound way to practice solving linear equations. The game features a random generator that creates thousands of problems for endless practice in coordinating pairs on a graph, determining the equation of a line and solving for "x" and "y" coordinate pairs.



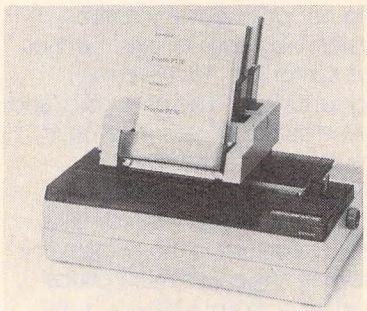
CIRCLE 23 ON FREE INFORMATION CARD

The object of the game is to recreate the course of your lost sister ship to locate its present position. In the process, you must learn to solve linear equations. Problems flash on the screen above a large workspace. The valiant reconnaissance scout must solve for "y" before plotting the x,y coordinates on a graph to locate the ship that's gone astray. Incorrect answers are identified, requiring reevaluation of tracking tactics and the selection of another approach.

"Mission: Algebra" is priced at $44.95.—**Designware,** 185 Berry Street, San Francisco, CA 94107.

INK-JET PRINTER, model *PT-90,* is a dot-matrix printer with an ink-jet printing system (32 nozzles) for letter-quality printing and graphics. It is particularly designed for use in final text preparation and processing.

The model *PT-90* has an overall resolution of 240 dots per inch, both horizontally and vertically. Its letter-quality mode offers a character resolution of 96 × 32 dots (at 10 cpi), indistinguishable from fully-formed characters. Its draft mode offers a character resolution of 48 × 16 dots, comparable to the best high-density impact printers.



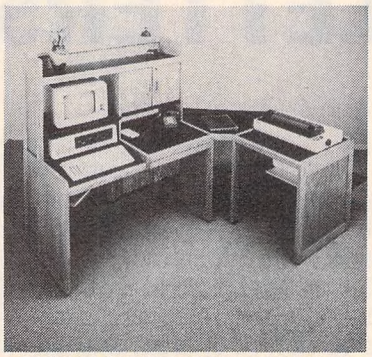
CIRCLE 24 ON FREE INFORMATION CARD

The *model PT-90* offers almost universal compatibility with popular systems and software.The suggested retail price is $3495.00.—**Siemans,** 186 Wood Avenue South, Iselin, NJ 08830.

COMPUTER FURNITURE, the Oak 170 Series, includes a desk, hutch, printer stand, corner connector, and monitor/printer platform, all in oak with a hand-rubbed finish.

The desk, model *CT-170,* has a dual-level top with adjustable keyboard and CPU shelves. The entire lefthand surface can be lowered to a typing height of 27", 28", or 29". Detachable keyboards can be tilted at 5°, 10°, or 15° for user comfort. The desktop's fixed half can hold a cassette or disk drive, and even a printer. A pencil drawer slides below. The model *CT-170* is priced at $329.95.

The add-on hutch, model *CTA-171,* includes a monitor shelf and two adjustable storage shelves. The monitor shelf can be raised or lowered to put the video monitor at the proper eye-level, and can also be tilted to reduce glare. The model *CTA-171* measures 28" × 49" × 13" and is priced at $219.95.



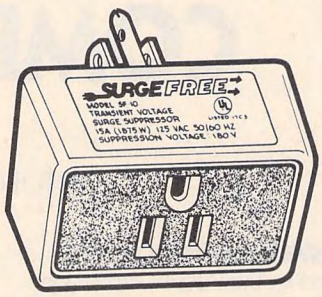
CIRCLE 25 ON FREE INFORMATION CARD

The printer stand, model *CT-175,* has two top paper slots to accommodate either rear- or bottom-feed printers, and two interior storage shelves. The forms receiving shelf on the back can be raised or lowered depending on the user's needs or office location. The model *CT-175* measures 29" × 25" × 28" and is priced at $229.95.

The trapezoid corner connector, model *CTA-173,* can join the desk and printer into a complete work center. It can be attached to either the right or left side of the desk, as the user prefers. It is priced at $79.95.

The monitor/printer platform, model *CTA-172,* can be used with the desk to hold a monitor or micro printer. It also has a tilting feature to reduce monitor glare, and measures 9" × 22½" × 11¾". It is priced at $49.95.—**Bush Industries, Inc.,** 312 Fair Oak Street, Little Valley, NY 14755.

SURGE SUPPRESSER, the SurgeFree model *SF-10,* is a single-socket electronic power center for residential use. It features fail-safe, solid-state, surge-clamping electronic circuitry. Rated at 15 amps (1875 watt) 125-volts AC, it instantly detects and suppresses high-



CIRCLE 26 ON FREE INFORMATION CARD

voltage spikes and surges, protecting such electronic equipment as personal computers, color-TV, and microwave ovens or any sensitive devices. It is priced at $12.95.—**Ultima Electronics, Ltd.,** 21 Central Drive, Farmingdale, NY 11735.

SOFTWARE REVIEW

Telecommuter—Integrated word processing and communications for PC-compatibles and lap computers.

HERB FRIEDMAN

■*Telecommuter* is an integrated word processing and communications package specifically designed for the users of IBM-compatible and Radio Shack lap computers (and the NEC 8201A lap computer). The program is based on the concept that most persons using an IBM-compatible personal computer at the office and a lap computer in the field don't want to become computer scientists in order to integrate the two. By making the office computer emulate and support the lap computer, *Telecommuter* creates a totally integrated word processing and communications environment that employes the same functions: Except for the word processor, both IBM-IBM-compatibles and the lap computers function the same way for communications and text creations: The difference in the word processor is that the IBM is a full-fledged word processor, not a text editor: It is intended for the creation of business documents or for the reworking of text, data or even BASIC programs that originated in a lap computer's text editor.

Host and cable transfer too.

In addition to the word processing and communications functions, *Telecommuter* provides HOST and CABLE TRANSFER modes. In the HOST mode the disk drives of the office Computer can be accessed directly from the field by the lap computer—or any other remote computer—and data, documents, or whatever, can be exchanged between the disks and the remote computer. For example, consider the field technician who might need to know the availibility of spare parts, but the home office is closed for the day. By using a remote computer to access the office *PC* he could check inventory files, even start the office printer and leave a message telling the first person in the next morning to pull the parts and ship them express. Or, he might write a complete report of his efforts using the lap computer's text editor and then upload the report directly into the office *PC*'s "electronic mailbox."

All this may sound complex. It's not. When the lap computer accesses the office *PC* the commands seen at the remote site appear almost exactly as they do at the *PC* itself; the user actually works in PC-DOS when using the *PC's* functions from the remote site. He can call for a DIR of either drive, ERASE, COPY, WRITE and READ files, even start and stop the office printer. It functions the same way on both ends.

Telecommunter is intended for use with a Hayes Smartmodem, a Radio Shack Modem II, or a Tandy 1000. The HOST mode can easily accommodate the small business having one phone line because *Telecommuter* allows a Smartmodem's bell (ring) pickup to be programmed by the user through a configuration menu. Instead of having to put up with an automodem answering on the first or second ring, a Smartmodem can be programmed to pick up on, the fifth ring so the computer can be left on-line at all times. Someone will usually answer before the fifth ring; if not, the computer answers the line. With this feature, the user doesn't have to wonder whether the computer and modem are turned on or off, they can be left on, or turned on by a time clock because *Telecommuter* can be set to cold boot directly into the HOST mode. For those who are into serving as a HOST for other computer systems and users, *Telecommuter* comes with a special FILTER program that converts *WordStar*'s word processor.

It's safe.

Meddlers and other unauthorized users can be kept out of the HOST computer by using an optional password of up to 14 characters. If the correct password isn't entered by the fourth try *Telecommuter* automatically disconnects from the telephone circuit.

The *Telecommuter* package includes a special null modem cable that permits direct cable transfer—UPLOAD and DOWNLOAD—between the office and lap computers, or any other computer. If the user returns to the office, the material in the lap computer can be directly transferred into the office PC at speeds up to 9600 baud. However, 9600 baud assumes the computers are close to the same tolerance. We have not found that to be so, and generally run direct cable transfers at 2400 baud.

Virtually every parameter is user-programmable through installation and configuration menus: This includes color or monochrome screen display, password selection, communications default drive, communication parameters, individual selection of COM1 or COM2 for the RS232 and modem I/O's, individual baud rate, stop bit and parity for all communications modes, modem set and reset control codes, even printer selection. *Telecommuter* automatically plugs in the correct boldface, underline and optional control codes for commonly-used Radio Shack, Epson, IBM, Itoh, NEC and Diablo printers.

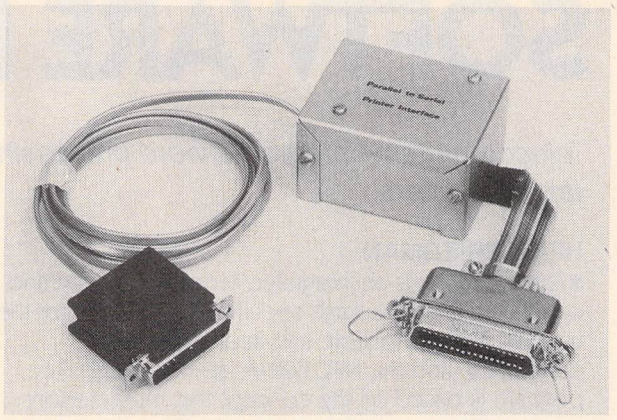
The one thing *Telecommuter* cannot do is protocol (binary) transfers. The program is specifically intended for communications and the preparation of text and documents. In these areas its performance is superb.

Telecommuter Integrated Word Processing Communications Software, Sigea Systems, Inc., 19 Pelham Rd., Weston, MA 02193. For IBM *PC* and *PC/XT* compatibles and Tandy 2000, 1200, 1000. computers with internal or external modem. Price: $200 postpaid, includes postage and handling.◀◍▶

PARALLEL TO SERIAL INTERFACE

Interface a Centronics parallel output to an RS232 serial printer.

R. L. L. Hu



■If you built your computer system using boards and peripherals from different manufacturers, you have probably experienced the frustrations and confusion of mixing and matching interfaces. This project meets the real need to interface a Centronics parallel output to an RS232 serial printer.

How the circuit works

Refer to the schematic diagram, Figure 1. Parallel data from the printer controller is loaded into IC1, a 74LS165 shift register by the STROBE signal if the BUSY line is low. This STROBE signal also clears IC2, a 74LS161 binary counter and presents IC3-a, a 74LS74 flip-flop. On the positive edge of the STROBE1 pulse, IC3-b is clocked and the BUSY line to the printer controller goes high. Since most parallel interfaces found today use only the STROBE1 and BUSY lines for handshaking, the ACK signal was not implemented in this design. The BUSY line will be kept high for a minimum of 10 clock cycles for each byte transferred. During this interval, the parallel data loaded will be clocked out serially through IC3-a: first the start bit, then followed by 7 data bits and ending with 2 stop bits (total of 10 bits). The

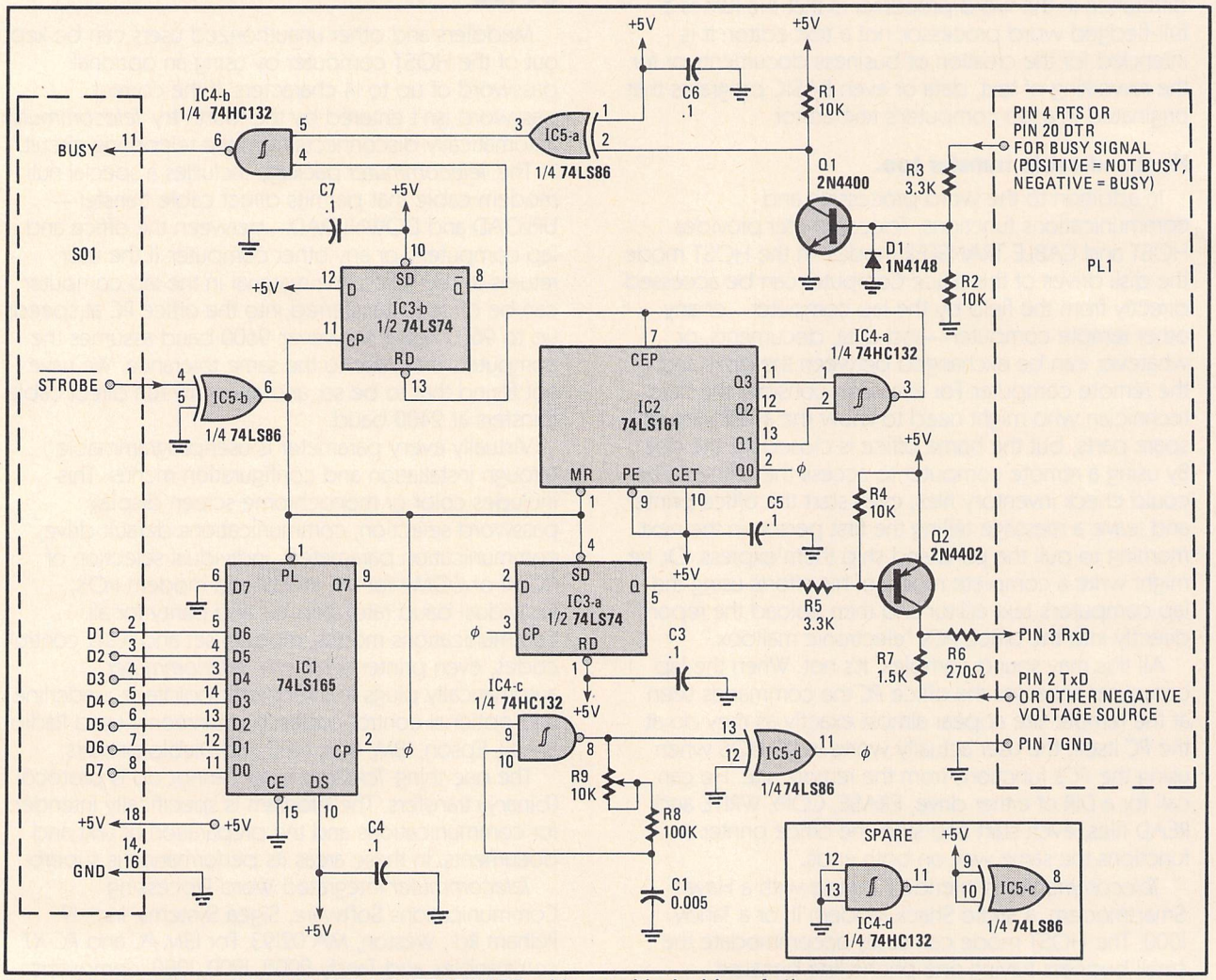


FIG.1—SCHEMATIC DIAGRAM IS STRAIGHTFORWARD with no critical wiring. Author used wire-wrap method, on ordinary perfboard. For better understanding, refer to the schematic while reading "How it works" section.

BUSY line can also be held high by the serial printer if the printer buffer becomes full, that holds off any further data transfer from the printer controller. Many serial printers use either pin 4 (RTS *R*equest *T*o *S*end)) or pin 20 (DTR *D*ata *T*erminal *R*eady) to signal this buffer-full condition.

To keep the overall parts count low, the 74HC132 (high-speed CMOS) Schmitt-trigger was used for IC4. That IC lends itself well to operating as an oscillator simply with the addition of a resistor and a capacitor. The oscillator runs at 2400 Hz or 2400 baud with the values of R and C shown.

Since the STROBE pulses occur asynchronously (when the BUSY line is low), it is possible to have the positive edge of a clock pulse arrive just at the instant the STROBE pulse goes high. Unfortunately, that would result in an unpredictable outcome. However, with the clock circuit shown, which is not the same as gating the output of the oscillator, a setup time is ensured between the last STROBE pulse and the next clock pulse. Pull-up resistors were not used in interfacing LS TTL to this CMOS, since with CMOS gates as the only load on the LS TTL outputs, the LS TTL outputs will generally rise up to one Vbe below Vcc.

Transistors Q1 and Q2 serve as voltage trasnslators, and diode D1 keeps the base of Q1 from going into negative or reverse breakdown.

Construction.

The layout of the components is not critical. The prototype was built using wirewrap technique. The RS232 receiver and driver components were all mounted on a single 16-pin component header and plugged into a wirewrap socket. The whole circuit board fits into a small chassis box (Radio Shack 270-235), with one end of the box for the parallel interface connections and the other end for the RS232 interface connections. It is best to keep the parallel interface cable short and extend the RS232 interface cable to the length desired.

Do not substitute the 74HC132 with 74LS00, unless you plan to design your own oscillator. The baud rate of this interface board can be changed to suit your printer or your inclination. However, not much can be gained by running at a baud rate greater than 2400, unless you have a very fast printer (240cps) or a print spooler, since data transfer occurs concurrently with printing anyway.

Note that some serial printers use an active-low BUSY signal, in which case, pin 1 of IC5 should be tied to ground instead of Vcc.

Powering-up the interface

The 5-volt supply needed to run this board can usually be obtained from the Centronics end of the interface. Check your printer controller documentation to see if it is available at one of the connector pins. If not, it would be a simple matter to install a jumper from the 5-volt source on the printer controller board to one of the connector pins. The negative supply (-9, -12, -15V. etc.) may be obtainable from the serial printer end of the interface. Check the documentation for the printer; if pin 2 (TxD *T*ransmtted *D*ata) is unused and remains at a negative RS232 voltage level when operating, then it may be usable as the negative voltage source to drive the RxD (*R*eceived *D*ata) line.

Apply power to the interface board. Check and adjust VR1 for oscillator frequency of 2400 Hz. This frequency does not have to be accurate, since each start bit synchronizes the receiver clock of the UART/ ACIA in the printer. Timing errors are non-cumulative.

Troubleshooting.

If the printer prints the correct character each time, then the baud rate is set correctly. If you get garbage, check the baud rate. Now try writing a string of characters to the printer. If the printer worked in the single character mode but now it prints garbage, check and make sure the number of data bits, parity bit and stop bits on the printer are set as follows: 7 data bits, no parity bit and 2 stop bits, which is the same as setting for 7 data bits, mark parity bit and 1 stop bit.

PARTS LIST
Resistors
R1, R2, R4—10,000 ohms
R3, R5—3300 ohms
R6—270 ohms
R7—1500 ohms
R8—100,000 ohms
R9—10,000 ohm, 10-turn potentiometer
Capacitors
C1—0.005uF
C2-C6—0.1uF
Semiconductors
IC1—74LS165 shift register
IC2—74LS161 counter
IC3—74LS74 flip-flop
IC4—74HC132 Schmitt trigger
IC5—74LS86 quad OR gate
Q1—2N4400 transistor
Q2—2N4402 transistor
D1—1N4148 diode

The number of stop bits sent by the interface board can be increased from 2 to 4, if your printer lacks the flexibility in data format settings, by simply moving the wire from Q1 to Q2 on IC2.

If the printer prints okay initially, but starts to drop characters after a while, it is likely that the printer buffer overflowed due to improper handshaking. Check the busy line from the printer to the printer controller. If the problem is still not resolved, set up a scope loop by disconnecting the printer and issuing continuous print commands, remembering to tie up or down, depending on your particular printer, to the printer busy line. Now is a good time to pause and reflect, before you become too deeply involved in troubleshooting, on a couple of things which should have been verified before hooking up the interface: that the Centronics controller itself works, and that the RS232 printer itself works also. This interface has been tested and used with Cromenco printer controller board, Heathkit HI4 dot-matrix printer (256-character buffer) and Smith Corona TPI serial daisy wheel printer (32-character buffer). Both have been working.◀●▶

ECG® LED Lamps

Philips ECG has LED lamps in shapes and sizes for virtually any application. They're available in round, rectangular, triangular and square shapes. They come in red, yellow, green, or even in two colors. And there's a choice of clear and diffused reds. Some have jewelled lenses. And some are even available as flashing LEDs with the flasher circuit built in.

In addition, long-life, shock-resistant, vibration-resistant, LED replacements for incandescent cartridge indicator lamps are also available in red, yellow or green.

Common applications: All LED indicator applications. LED cartridges are ideal replacements for cartridge-type incandescent lamps.

CIRCLE 297 ON FREE INFORMATION CARD

ECG® High-Voltage Rectifier and Voltage Divider Network

Philips ECG's ECG568 is a high-voltage rectifier used in Sanyo and Sears TV sets to supply high voltage to the picture tube. It also contains a voltage divider network which supplies focus voltage to the picture tube.

Common applications: For use in television service and repair.

CIRCLE 298 ON FREE INFORMATION CARD

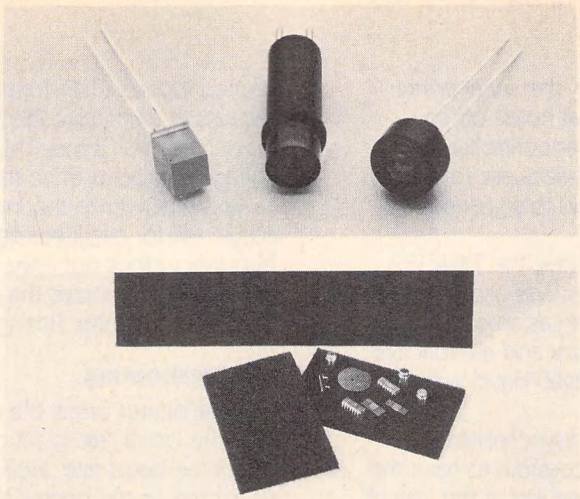
EMF® Transient Voltage and RF Interference Suppressors

EMF transient voltage surge suppressors by Philips ECG clamp voltage spikes on 120 VAC line to levels safe for all electronic equipment. They can handle up to 40% greater surge current than other suppressors. Single outlet suppressors are available in both two- and three-prong versions.

The multiple outlet EMF315 incorporates both a spike suppressor and a PI filter to suppress RF interference on the AC line. RF interference causes audio and video degradation and causes digital equipment to function imperfectly.

Common applications: Electronic equipment such as hi-fi and television, stereo, computers or other line-operated electronic equipment subject to voltage surges and radio frequency interference from the AC line.

CIRCLE 299 ON FREE INFORMATION CARD



ECG® A-STAT Material

Philips ECG has two sizes of anti-static foam that will prevent damage to semiconductors from static electricity. The A-STAT 12 measures 12″ x 12″ and is perfect for bench use. The A-STAT 2 measures 3″ x 5″ and can be carried in the tool box. When semiconductors are kept in A-STAT foam, static electricity is shunted through the foam instead of into the semiconductor, where it could have caused damage.

Common applications: Essential for semiconductor protection on the workbench or in the field.

CIRCLE 274 ON FREE INFORMATION CARD

The one thing we make that you have to replace every year.

The new and expanded ECG® Semiconductors Master Guide.

Your new Master Guide will be looking as dog-eared as the old one before long. Because this year the Master Guide has been expanded to include more than 400 new products and almost 25,000 new cross references. The Master Replacement Guide for 1985. 656 pages. Over 3,500 different ECG devices that provide replacement coverage for more than 227,000 industry types. And everything in the book is cross-referenced so you can find what you're looking for fast, and be sure it fits. Plus, everything we make meets or exceeds the original JEDEC or application specs. So it works. It's the only book you'll need. But you'll need a new one every year.

To get a copy of the new Master Guide, go to your nearest Philips ECG distributor. For his name and location, just call: 1-800-225-8326 (in Mass., 617-890-6107).

If it's ECG, it fits. And it works.

PhilipsECG

A North American Philips Company

Dedicated to Excellence.

CIRCLE 68 ON FREE INFORMATION CARD

BUILD THE MODEM MINDER

You don't have to sit there watching and waiting...

KIRK VISTAIN

■Like many computer users, I enjoy communicating with remote CP/M and bulletin board systems. And like many, I've spent much of my time hearing busy signals and redialing. That's why I was so happy to get a copy of MEX, the public domain Modem Executive program. With it, I could tell the computer to keep dialing a number until it connected, without my intervention. But, I ran into a slight problem. The computer is supposed to make life simpler by eliminating the need for human intervention in mundane, repetitive tasks. Yet there I was, sitting by the terminal, watching a number being dialed over and over again. Why? Because I had to know when a connection was made. Perhaps like many of you, I have a computer which does not support a terminal bell. So the only way to know when I had reached a remote was to watch the screen. I know what you're thinking. Turn the volume up and go do something productive while you're waiting. High volume? That doesn't help your concentration. That's why I designed the Modem Minder (Fig. 1).

FIG. 1—WITH UP-FRONT CONTROLS and a small footprint, the Modem Minder fits nicely just about anyplace.

How the Modem Minder works.

When your computer attempts to ring up a remote, it waits until it hears the answering computer's acknowledgment tone of 2225 Hz and responds with its own 1270 Hz signal. It is this tone that the Modem Minder senses acoustically.

When used with a direct-connect modem, such as the Hayes Smartmodem, it monitors the speaker output, which can be set to an unobtrusive level, and sounds a piezo buzzer when it detects the 1270 Hz tone from the originating computer. You can go about your work while the computer tries to connect, and be notified when it does, without being distracted by the dialing tones.

Design.

I designed the Modem Minder to meet several goals. First, it had to be as isolated as possible from the circuitry of both the modem and computer. This is good practice whenever you build an add-on device. Modifying commercial designs is a risky business, and will generally void any warranty you might have. The idea of hard-wiring an unproven circuit to a $250 modem just isn't appealing, unless you're a fireworks buff. So I opted for acoustic coupling. This means that the modem must have an internal speaker. All the stand-alone Hayes models and many others do, so this seemed a valid approach.

Parts availability and ease of construction constituted the second criterion (Fig. 2). This meant using off-the-shelf devices and a simple circuit. Since the Modem Minder would probably not be used for extended periods of time, the complexity of an AC supply seemed excessive, so battery power was chosen.

Because it would be sitting close to the computer, Modem Minder would have to reject noise and speech. More importantly, it would have to distinguish between the desired 1270 Hz tone and the other tones it would be likely to hear on the phone line, especially the uncomfortably proximate 1209 Hz touch-tone signal used with numbers 1, 4, and 7.

The circuit shown in the schematic, Fig. 3, satisfies these requirements. IC2-a is configured as a non-inverting amp with a gain of approximately 30. The acoustical transducer is a ceramic microphone chosen mainly for economy and its limited frequency response, which helps reduce noise problems. C4 eliminates the DC offset component of the amplified mike signal and feeds the input (pin 3) of a 567 tone decoder IC. Since the detection bandwidth of this IC is amplitude sensitive at signal levels below 200mV, the preceding preamp stage provides signal above this level.

The approximate detection frequency of the circuit is determined by the series resistance of R1 and R8, and C1, according to the formula $f = 1.1/((R1 + R8) \times C1)$ where f is the center frequency of the internal current controlled oscillator (CCO). R8 is used to compensate for component tolerances, and to allow precise adjustment of the detection frequency. Capacitors C2

and C3 set the detection bandwidth at about 4% (1219-1320 Hz) at input levels of greater than 200mV.

The combination of R2 and D1 provides a feedback path which causes the output of IC1 to latch until disabled by a positive pulse at pin 1 from RESET switch, S1.

Pin 8 of IC1 is an active low output. This means it goes from near the positive supply rail to ground when it detects a tone. This signal is fed to IC2-b, which is wired as a comparator. R6 and R7 set the voltage at pin 12 to approximately 1V. As long as pin 13 remains above this level, the output of the comparator is negative, which disables piezo buzzer, PB1. D2 protects the buzzer from reverse polarity.

When a detected tone causes the output of the decoder IC to drive pin 13 below the level of pin 12, the output snaps up to the positive supply rail and causes the buzzer to sound, until RESET is pushed.

Construction.

I tested the design of the Modem Minder on a Heath Digital Design Console, a handy device for the experimenter. The prototype was built on an etched board, (see Figs. 4 and 5), although, for one-time construction, wiring the device on perfboard would be quicker.

Most of the parts are readily available at electronic supply stores, or maybe even in your junk bin. A few parts need explanation. The type of ceramic microphone you use may determine the amount of gain required in the preamp. The design goal is to provide the input of the 567 tone decoder with a minimum of 200mV at 1270 Hz, with the modem's speaker output set to an unobtrusive level. If you need to adjust gain, change the value of R3. A higher value means more amplification, a lower one less. At gains above 500, offset might become a problem, but you'll probably never need to go that high.

Microphone and case.

One important consideration is how the modem's speaker is mounted. If it is on the bottom of a stand-alone design, such as the Hayes Smartmodem, you can cut a hole in the Modem Minder case, just slightly smaller than the microphone module. The module is then mounted from inside the case, facing up, that is, toward the modem's speaker. The modem sits atop the case with its speaker over the microphone opening on the Modem Minder. This allows it to block most extraneous noises, as well as keep phone line signals to an unobtrusive level.

The size of the case will be determined by the type of modem you are using and the way you mount it in your system. If you are dealing with an outboard device the box should be big enough to support it, but small enough to fit between the feet. That way, intimate contact is maintained and audio leakage from the speaker is minimized.

For those of you with Hayes Micromodems, or other types, which are mounted inside the computer, or have unusual speaker locations, it may be necessary to place the microphone, in its own enclosure, over the speaker,

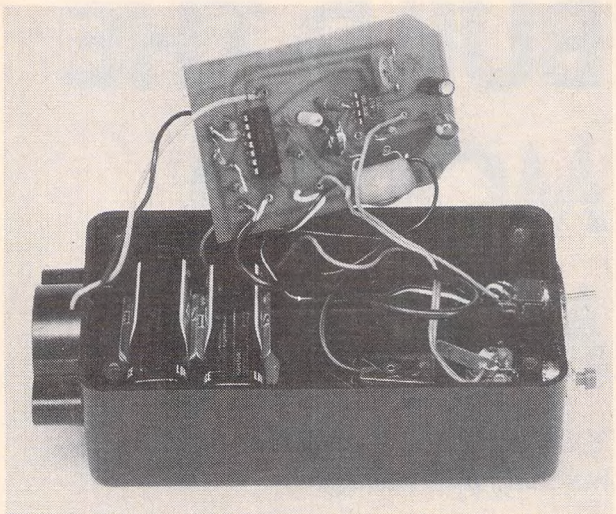


FIG. 2—INSIDE THE BOX, compact parts placement and easy wiring is revealed. Nothing super-critical makes this a comfortable project.

and connect with shielded cable to the separately mounted Modem Minder electronics.

Adjustment and use.

There are several ways to adjust the 567 to the correct frequency. The most obvious is to connect a frequency counter to pin 6 of the 567 and adjust for a 1270 Hz output. If you don't have a frequency counter, you can simply dial up a remote computer and wait for the modem to answer back with the 1270 Hz signal. This will likely require several tries, since the tone doesn't last long.

When you first power up, the Modem Minder's

PART LIST

RESISTORS
All resistors ± 5% unless otherwise specified.
R1—2200 ohms
R2—18,000 ohms
R3—15,000 ohms
R4—470 ohms
R5—1 megohm
R6—8200 ohms
R7—1000 ohms
R8—2500 ohms linear trimpot*

CAPACITORS
C1—.22μF
C2—10μF
C3—22μF
C4—.01μF

SEMICONDUCTORS
IC1—LM567 Tone decoder
IC2—LM324 Quad Op Amp
D1, D2—1N4148 Didoe

MISCELLANEOUS
MIC—Microphone element
BZP1—Piezo buzzer
SW1—SPST, N.O., Momentary contact
B1, B2—9-volt battery
Enclosure, perfboard or printed circuit materials, hardware.
*A 2500 ohm potentiometer is preferred but a 5000 ohm will work adequately.

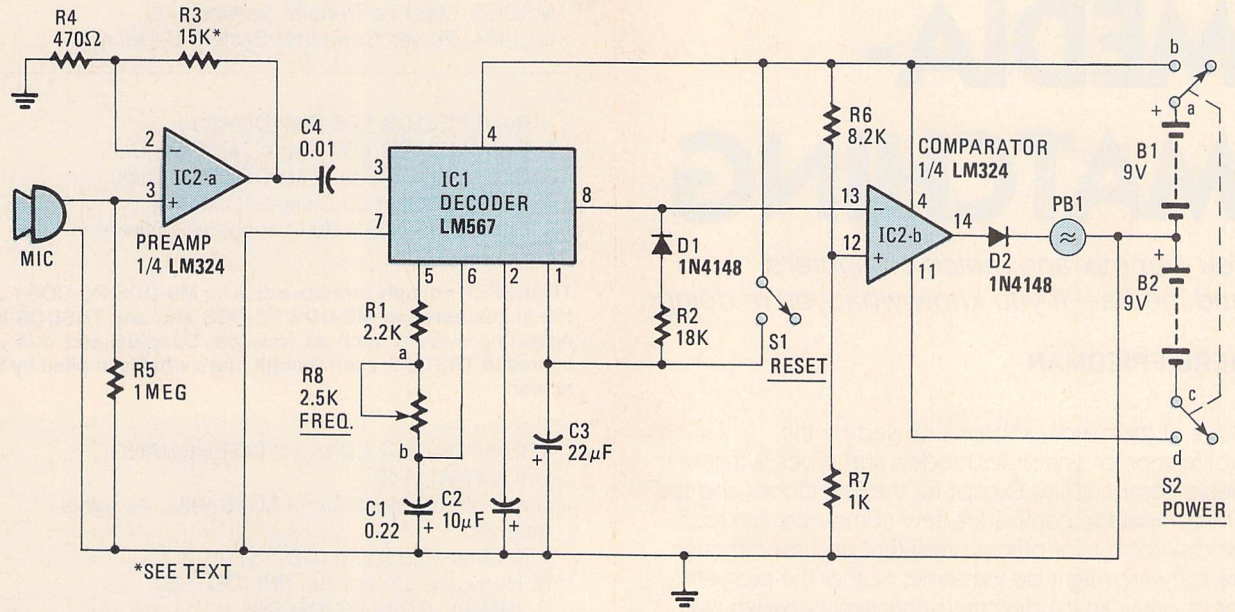


FIG. 3—SCHEMATIC DIAGRAM holds no secrets. It's easy to follow, and should be referred to while reading the text. For more information on R3, the 15K resistor, refer to the text.

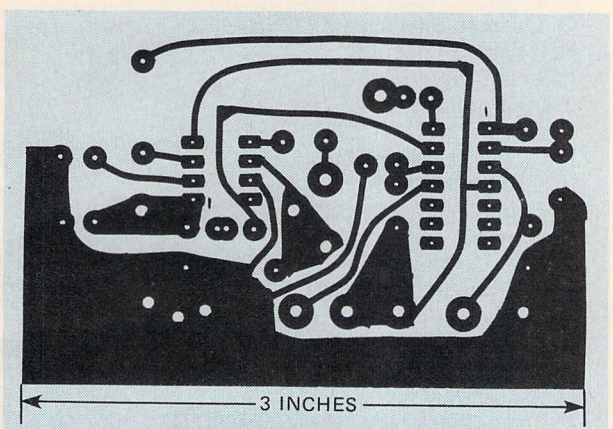


FIG. 4—FULL-SIZE CIRCUIT BOARD LAYOUT is provided here, looking at the circuit side.

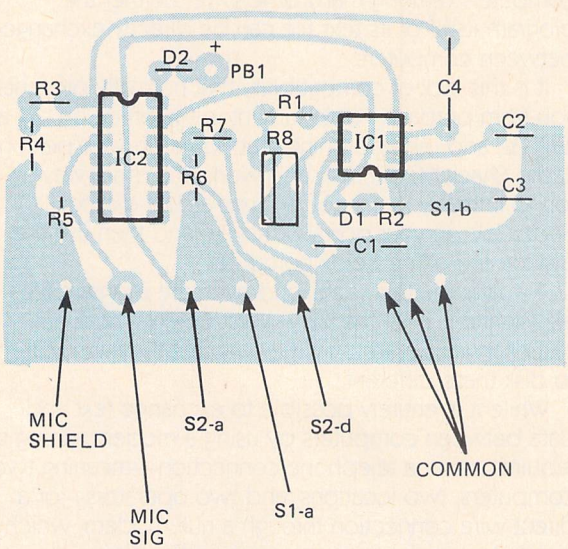


FIG. 5—PARTS PLACEMENT is shown in the above diagram.

buzzer will latch on. Pushing RESET will stop it. You could probably use the remaining two opamps in the LM324 to devise some sort of automatic-reset-at-power-up circuit, but I prefer the beep, because that tells me the batteries are good and most of the circuitry is operational.

Just a quick word about computer etiquette: It's best to be certain you're dialing the right number before you leave the terminal unattended. Imagine how you'd feel if someone's computer got your number by mistake and kept calling every two minutes, early some Sunday morning!

The Modem Minder is one of those unusual devices that you might look at and decide to build because there's nothing much on television that night, and you've got most of the parts in your junk box anyway, and besides, it's raining out. It is, after all, an interesting project, and the building doesn't take all that long to complete. What makes it unusual, is that after you've built it and installed it, you check it to see that it's operational, and then you start using it. And before long, you wonder how you ever got along without the thing! My own unit is in constant use and if I've got any regrets at all about it, it's only that I wish I had built it a long time ago. If you're using a computer, and using a modem, the Modem Minder is one ancillary device you've got to have.

Computer databases, bulletin boards, and remote systems are fun to use, but for that very reason you're likely to run into a lot of busy signals. To make your time more productive, let the Modem Minder sit around waiting for a connection, while you go about your business. You can trust it to buzz you as soon as the connection is made. I'll be glad to answer any questions you might have about this device. Just send your mail in care of this magazine, or leave me a message on Compuserve, EMAIL box 72356, 1355.◀CD▶

MEDIA-MATCHING

You can mix and match computers and media—If you know what you're doing.

HERB FRIEDMAN

■One of the major problems caused by the proliferation of computer models and types is that of media compatibility. Except for the IBM clones and the IBM-compatible computers, few computers can read the disk formats of other computers, and even though the software might be the same, neither the program nor its data can be directly exchanged between two different computers.

For example, the same version of *WordStar* is available for Osborne, KayPro and Radio Shack computers (among many others) yet neither the program itself or its text file can be directly exchanged between computers.

It is this lack of compatibility that normally prevents you from preparing a document in the office on say, an IBM-*PC*, and then polishing it at home on your personal Radio Shack *Model III*. It also works the other way round in that you cannot prepare a data disk for *SuperCalc* on your portable KayPro and then use the disk on the office Xerox computer.

Actually, the text, data, and even the program files are identical, or at the very worst not identical but interchangeable; it's only the way that they are written to disk that's different.

While it is entirely possible to exchange text and data between computers by using a modem, doing so requires either a telephone connection—meaning two computers, two locations, and two operators—or a direct wire connection through a null modem, which means having the two computers adjacent or physically near each other. Either way, it's a very incovenient way to do things.

The simplest and most convenient way to exchange software between computers is to move the disks from computer to computer regardless of the manner in which the disk was electrically formatted by the originating computer. While this was almost impossible to do several years ago, today there's a seemingly endless list of low-cost programs (utilities) that allows almost any professional computer to read, and sometimes write in the format of most other computers.

In practical terms this means that you can prepare a *SuperCalc* spreadsheet on the Office IBM-PC, and then directly use the data disk on your Osborne; or at worst, you'll have to exchange the data to a disk formatted for the Osborne. Either way, all you're carrying from location to location is a disk, not a full computer.

```
MSDOS 1.00 File Transfer Version 1.00
(c) 1984, Purves Computer System Software

1. Read MSDOS 1.00 Disk Directory
2. Copy MSDOS 1.00 File to TRSDOS Disk
3. Copy TRDOS File to MSDOS 1.00 Disk
4. Sort MSDOS 1.00 Diskette Directory
5. Format MSDOS 1.00 Compatible Diskette
Enter Selection:
```

TRANSFER not only formats a disk for MS-DOS/PC-DOS 1.0, it translates between ME-DOS/PC-DOS and any TRSDOS-like operating system such as Newdos, Dosplus, etc. It is not limited to TRSDOS, even though that's what is implied by the screen.

```
TRS-80 Model 4 CP/M 2.2 INTERCHANGE
PROGRAM vl.42
Copyright (c) Montezuma Micro 1983. All rights
reserved.
A. Montezuma Micro (DD,SS)
B. Hurricane Compactor I&II (DD, SS)
C. IBM PC CP/M-86 (DD,SS)
D. Xerox 820-1 (SD, SS)
E. Xerox 820-2 (DD, SS)
F. Osborne-1 (SD, SS)
G. Osborne Executive (DD, SS)
H. Kaypro-2 (DD, SS)
I. Zenith H-89 (SD, SS)
J. Zenith Z100 (DD, SS)
K. Zenith Z100 (DD, DS)
L. Cromeco Z-2 (SD, SS)
M. Cromeco Z-2 (DD, SS)
N. Eagle 80trk. (DD, SS)
O. Lobo MAX-80 (DD, SS)
P. LNW Computers LNW80 (DD, SS)
Q. MM Shuffle Board (DD, SS)
R. Holmes VID80 (DD, SS)
S. Omikron Mapper I (SD, SS)
T. Morrow Micro Decision (DD, SS)
U. Access Matrix (DD, SS)
V. Radio Shack Mod.4CP/MPlus(DD,SS)
W. Televideo 802 (DD, DS)
X. HP-125 (DD, DS)
Y. DEC VT-180 (DD, SS)
Z. NEC PC-8001A (DD, SS)
Select disk formnat by pressing [A-Z]

Press "BREAK" to exit to the CP/M operating system
```

INTERCHANGE for the MODEL 4 CP/M is one of the most flexible and powerful translators, because it permits an alien disk to be run on the host computer. About the only thing it can't do (at least at the time of this writing) is translate to MS-DOS/PC-DOS.

Different formats.

The reason for disk incompatibility is the way in which the information is stored on the disk. For whatever reasons—greed, or an honest belief that their system is better—manufacturers store data in different ways. Even the directory track—the list of disk files and where they are located on the disk—varies from manufacturer to manufacturer. For example, some computers have the directory on track 17, others have the directory on track 20, or track 2, or track 3. Obviously, if a computer is looking at track 17 for a list of files it won't find anything if a particular disk's

directory is on track 2.

Then there's the way in which the data itself is recorded. The directory listing for each file contains information as to which tracks and sectors used for the files, the amount of space used, etc. The file itself has assorted block markers, pointers, and checksums in addition to the data itself. Even if a computer could locate a file on an alien disk, it most likely won't understand the markers, pointers, checksums, and other bits and pieces of control information that must be interpolated before it's possible to read the data. (Alien means a disk from a different kind of computer.)

Similarly, even if the computer could write to an alien disk the file probably could not be located or used by the computer for which the alien disk was intended.

Media compatibility.

The way out of this seemingly impossible morass is to use translation software that reads and interpolates an alien disk's data to the host computer's format. Actually, the best translators can read and write most of the commonly used disk formats. Though most translation software accommodates a broad range of computers—a few specifically translate for only two or three computers—at the worst it requires two different translators to accommodate all the most popular disk formats. The major exceptions are the Apple, Atari and Commodore disk formats, for which there is presently no direct translator.

Disk translation programs are designed for computers with at least two disk drives, one of which must be a 5¼-inch floppy (the other can be a floppy or a hard disk). The program itself can be on a 5¼ diskette or on a hard disk; the alien disk, however, is always a 5¼-inch diskette: there is no such thing as an alien hard disk.

The translator causes one disk drive of the host computer to read (and sometimes write) the alien format. Once the translator is installed the alien format drive can no longer read or write in the host format.

Some of the older translation programs can only read from the alien disk. For example, if the host computer is an Osborne and the alien disk is from an IBM-*PC* the translator will read the IBM disk and copy the files directly to an Osborne-format disk. The more modern translators can exchange data in both directions; meaning data can be read from the IBM disk and written to the Osborne disk, or read from the Osborne disk and written to the IBM disk. Another difference between the older and more modern translators is that many of the older translators processed all files, the user could not pick and choose. The modern translators allow the user to select one or more files for translation.

The most modern translators such as Media Master, Uniform, and TRANSFER can even format an alien disk, which means you don't have to carry disks back and forth. For example, assume you have a document created on a Radio Shack *Model III* using the *TYPITALL* word processor and you want to use the document on the office IBM clone. The program TRANSFER first allows you to format a blank disk in the IBM format, and then it will copy the document from the Radio Shack host disk to the newly-created IBM disk.

```
MEDIA MASTER V1.02 (4/18/84) -- Osborne I and
Executive
(c) Copyright 1984 MDG and Associates
1. COPY file(s)
2. PRINT directory
3. DISPLAY directory
4. LOG in a new diskette
5. ERASE file(s)
6. VERIFY or write toggle (VERIFY is ON)
7. FORMAT a diskette
8. EXIT to CP/M
Press selection followed by <return>

Single Sided Formats Available

A. Osborne (DD)
B. Osborne (SD)
C. DEC VT180
D. IBM PC CP/M
E. IBM PC-DOS 1.0
F. IBM PC-DOS 2.0
G. TI Professional CP/M
H. TRS-80 I w/Omikron
I. TRS-80 III w/Mewm Merch
J. TRS-80 IV CP/M
K. LNW-80
L. Xerox 820 I (SD)
M. Xerox 820 II (DD)
N. NEC PC-8001A
O. Actrix
P. Cromeco w/Int'l Term
Q. Cromeco CDOS (SD)
R. Cromeco CDOS (DD)
S. Lobo MAX-80
T. Morrow MD2
U. Kaypro II
V. Zenith Z90
W. Heath Z100 CP/M
X. Heath w/Magnolia
Y. Systel II CP/M
Press selection followed by <return>
```

MEDIA MASTER does not support running a programming but it is most efficient at handling translation. The supported formats are the most modern and extensive for CP/M computers, and they include translation to/from IBM PC-DOS and PC CP/M.

Run time.

While the ability to read and write alien formats is by itself spectacular, some of the translation programs even allow a computer to run directly from the alien disk. For example, Montezuma Micro's translator called *Interchange*—which is supplied with their version 2.2 CP/M for the Radio Shack *Model 4* computer—will run a generic CP/M program directly from the alien disk. ("Generic" means a program that isn't hardware dependent for a specific computer—a program that will run on any conventional CP/M computer.) If you have, say, the word processor *WordStar* and the spelling checker The Word Plus on a Kaypro disk, *Interchange* allows you to run them directly on the Radio Shack *Model 4*. In fact, *Interchange's* transfer is so effective that you can write data to either the alien disk in the alien format, or to the Radio Shack format disk

located in the A: drive.

While it is often possible to run a program directly from the alien disk, it can only be done if both the host and alien computers use the same CPU and the same operating system. The reason we can run KayPro programs on the Radio Shack *Model 4* is because both use the Z80 microprocessor and both employ the same version of CP/M. If we had CPM-86 or MS-DOS/PC-DOS programs on the alien disk they could not be run because the Z-80 op codes are different than those for the 8088 microprocessor, for which CP/M-86 and PC-DOS is written. In fact, unless the CPU's and operating system is the same there is really no point in translating binary encoded disk files because they won't run on an alien computer.

Translators are most effective when exchanging ASCII-encoded text and data because ASCII is directly transferable between computers. For example, if you have a document created with an MS-DOS version of

10 FORX=1TO10

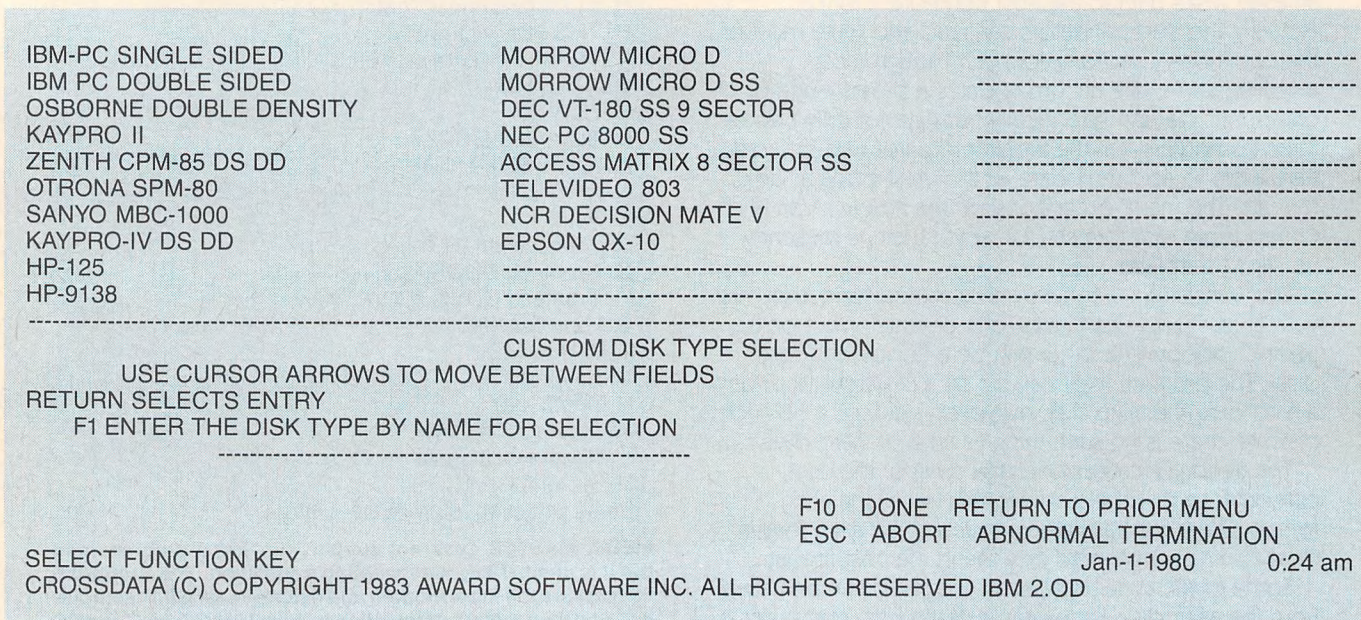
Microsoft's BASIC won't process the statement because most implementations require that commands be framed by spaces on either side. For Microsoft BASIC the statement must read:

10 FOR X=1 TO 10

Some translator programs can convert BASIC statements into other BASIC dialects. Generally, they accommodate only the most commonly-used statements; the user must then manually correct the unconverted statements when they are indicated as syntax errors. Usually, it's more trouble than it's worth.

Summing up.

Translation software is what prevents your old computer(s) from becoming obsolete. Unless you have



CROSSDATA translates many of the most common "commercially-used" CP/M computer disks to whatever IBM DOS you're using in either single or double-sided.

WordStar it will work directly with a CP/M version of *WordStar* if transferred to a CP/M machine. Similarly, ASCII *Peachtext, SuperCalc, dBase II* and *VisiCalc* files can be transferred between various computers and operating systems. If a program cannot process ASCII files directly it will have some way to convert the files to ASCII so they can be interchanged between different implementations or operating systems.

BASIC.

It is often difficult to transfer BASIC programs even if written in ASCII. The reason for what is apparent incompatibility is due to what is sometimes very subtle differences between the various versions of BASIC, even though the most commonly used BASICs are Microsoft BASIC. For example, Radio Shack's implementation of Microsoft BASIC uses a form of space compression to save RAM. While Radio Shack's BASIC can use the statement:

need for a new software that can run only on the latest computers—such as *Multimate*--you'll find that much of your software can run on both the old and new computers.

As example, because I work in several locations I must use several computers. This article originated on a NEC-8201 lap computer. It was dumped to a Radio Shack *Model I* for processing by *Typitall* whose files are non-ASCII. The *Model I* disk was carried to my home and spelling checked by *Hex Spell* on a *Model 3/4* (yes, there is a way to run *Model I* disks directly on a *Model 3/4*). A converted ASCII text file was finally translated using *TRANSFER* for the *Model 3/4* to an IBM-*PC* because my high speed modem is on the *PC*. The file eventually wound up in R/E's computer. The article went from something new, to something very old, and back again to something new. And it was all made possible by software that translates different disk formats.◀Ⓓ▶